

## Assessment of Knowledge on Hepatitis B infection, Hepatitis B Vaccine and Vaccination Status Among Health Care Workers in Tikur Anbessa Specialized Hospital

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Submitted: 17 Oct 2022; Accepted: 28 Oct 2022; Published: 01 Nov 2022

**Citation:** Alebachew Girum, Seble Worku, Aklog Almaw, Yohannes Birhanu. (2022). Assessment of Knowledge on Hepatitis B infection, Hepatitis B Vaccine and Vaccination Status Among Health Care Workers in Tikur Anbessa Specialized Hospital. *Archives Clin Med Microbiol*, 1(1), 10-19.

### Abstract

**Background:** Hepatitis B infection is usually higher among health workers than the general population, particularly in the sub-Saharan region. WHO recommends vaccination for all health care workers (HCWs) against the highly infectious, blood borne virus: HBV. However, previous studies reported that knowledge of HCWs toward the hepatitis B infection, Hepatitis B vaccine and their vaccination coverage was low and vary among HCWs in different settings.

**Objective:** This study was aimed to assess knowledge about HBV infection, HBV vaccine and status of HBV vaccination among healthcare workers in TASH, Addis Ababa, Ethiopia from March 10 to September 10, 2020.

**Methods and Materials:** Hospital based cross-sectional study was conducted on 358 HCWs who were selected randomly. Stratified random sampling method was used to collect the data using self-administered questionnaire. Then, the data was entered into Epi-data 4.2 version and was exported to Statistical Package for Social Science (SPSS) version 26 for analysis. All covariates that showed  $p$  value  $< 0.25$  in binary logistic analysis were further analyzed by multiple logistic regressions to detect true predictors.

**Result:** Among the health care workers, who participated in this study, 180 (51.4%) of them had adequate knowledge on the HBV infection. Medical doctors were the most knowledgeable among the HCWs, with interns [AOR=11.3(95% CI=4.5-28.6)], consultant physicians [AOR=7(95% CI=3.1-15.9)] & resident physicians [AOR=3.5(95% CI=1.9-6.9)] being significant predictors of good knowledge. Vaccination coverage was 60% which was predicted by a shorter work experience [AOR=4.7(95%=1.4-5.8)].

**Conclusion:** This study reveals that general knowledge level of HCWs about HBV is inadequate and vaccine coverage is suboptimal. Thus, concerned stakeholders should devote more efforts to improve the health care workers awareness about the virus and role of its vaccine and also more work to avail vaccine.

**Keywords:** Health Care Workers, Knowledge Level, Vaccination Status

### Introduction

Worldwide, more than two billion individuals are estimated to have a serological evidence of hepatitis B virus (HBV) infection, an infection caused by a partially double stranded DNA virus that belongs to the family of hepadnaviruses. Of these, 240 million are chronic carriers and approximately 600,000 die annually from HBV-related liver disease. Although the distribution varies across geographic settings, the overall prevalence of HBsAg is reported to be 3.6 percent. This viral disease presents with a number of clinical manifestations, ranging from acute (as in the case of subclinical/anicteric hepatitis, icteric hepatitis, and fulminant hepatitis) to chronic forms, the manifestations of which span from an asymptomatic carrier state to chronic hepatitis, cir-

rhosis, and hepatocellular carcinoma) [1-3].

Owing to various factors, the prevalence of chronic HBV ranges from  $<2$  percent in low-prevalence areas (eg, United States, Canada, Western Europe) to 2 to 7 percent in intermediate-prevalence areas (eg, Mediterranean countries, Japan, & Central Asia) to  $\geq 8$  percent in high-prevalence areas (eg, Western Africa & South Sudan) [2-4].

In Ethiopia, the overall pooled prevalence of HBV infection was estimated to be 6% while the prevalence among health professionals being 4.5-9.2%, indicating that significant section of health professionals are no immune from the disease [5].

Similar to the prevalence pattern, the predominant mode of HBV transmission varies in different geographical areas, mother-to-child transmission being the predominant one in high-prevalence areas. In comparison, horizontal transmission, particularly in early childhood, accounts for most cases of chronic HBV infection in intermediate-prevalence areas, while unprotected sexual intercourse and injection drug use in adults are the major routes of spread in low-prevalence areas [6, 7].

The infection rate of infants born to hepatitis B surface antigen (HBsAg)-positive mothers is as high as 90% among infants who do not receive HBIG and hepatitis B vaccination at birth [8]. The WHO suggests screening with both HBsAg and hepatitis B core antibody (anti-HBc) for blood donors [9]. For instance, in the United States, the residual risk of HBV transmission using this approach was lowered the risk of HBV transmission through blood transfusions to approximately 1 in a million [10, 11].

Percutaneous transmission usually happens among injection drug users (IDU) who share syringes and needles. A systematic review estimated that there were 6.4 million injection drug users who were anti-HBc-positive in 2010 [12]. On the other hand, in the healthcare setting, transmissions generally occur from patient to patient or from patient to healthcare providers (HCP) via contaminated instruments or an accidental needle stick injuries although the number has significantly decreased due to a number of measures including immunization against the virus [13].

Moreover, risk of HBV infection in an unvaccinated person with a single HBV contaminated needle stick injury is 6-30% and the prevalence of needle stick injuries among the Ethiopian healthcare workers based on the systematic review and met-analysis was 28.8% and 43.6% for the 12 months and life time, respectively, suggesting that vaccination against the virus prior to an exposure is the best way to prevent HBV infection in HCP [14].

The commonly used hepatitis B vaccines are extremely safe and have an efficacy of >90% against all HBV serotypes and genotypes. Thus, HBV infection can potentially be eradicated through global vaccination. Globally, vaccine coverage based upon completion of the third dose of vaccine (HepB3) has increased from 3 percent in 1992 to 84 percent in 2015 [15, 16]. Although there is no nationwide study on vaccination status in Ethiopia, but different surveys on health care workers reveal a low (2-60%) vaccination coverage status. The country started providing vaccination on new born babies in 2006 [17].

Most adults acquire hepatitis B virus (HBV) through sexual or percutaneous exposures. Transmission between sexual partners ranges from 18 to 44 percent. The risk of acquiring HBV through a percutaneous exposure has been reported to be approximately 30 percent if the source has chronic HBV. The proper and timely use of post-exposure prophylaxis with hepatitis B vaccine and/or HBIG can reduce HBV transmission by 70 to 90 percent [18].

Hepatitis B virus (HBV) infection is a major global health problem, with an estimated 257 million people infected with HBV worldwide in 2015 [19].

Approximately 887,000 deaths in 2015 were associated with two main HBV-related complications: cirrhosis and hepatocellular carcinoma [20].

The World Health Organization estimates that about 2 million health care workers face occupational exposure to HBV each year and 90% of the infections that result from these exposures are in low-income countries, especially those in sub-Saharan Africa [20].

Vaccination is best way of prevention HBV infection and it is the only vaccine preventable occupational disease. In Ethiopia there is no nationwide study on vaccination status among HCWs; but some study shows vaccination coverage was low. In selected health institutions of East Wollega zone, Western Ethiopia, insufficient knowledge about HBV and low rate of HBVV coverage of health care workers was reported recently [21]. Therefore, this study was designed to assess knowledge on HBV, HBVV and vaccination status among HCWs in TASH.

## Methods

### Study Area

The study project was conducted at Tikur Anbessa specialized hospital which is the largest hospital in Ethiopia located in the capital Addis Ababa. The hospital is a teaching hospital for the Addis Ababa University, College of Medicine and Health sciences and is involved in undergraduate, postgraduate and fellowship trainings in different fields of clinical medicine.

The staff are nurses, midwifery, medical laboratory ,pharmacist, medical interns, residents, fellows, & consultants in field of internal medicine, hematology, cardiology, pulmonology & critical care medicine, endocrine, gastroenterology & hepatology, emergency medicine, family medicine, neurology, Anesthetist & anestheology, oncology, dermatology, pediatric, General surgery, neurosurgery, pediatric surgery, plastic surgery, ENT surgery, maxillofacial surgery, cardiothoracic surgery, gyn/obs, pathology.

### Study Period

The study was conducted on TASH health care workers from March 10 to September 10; 2020.

### Study Design

A cross sectional hospital based study was conducted from March 2020

### Source Population

All health care workers working at TASH during study period

### Study Population

All health care workers working at TASH who fulfill inclusion criteria

### Inclusion and Exclusion Criteria

#### Inclusion Criteria

- All HCWs who has contact to patients In TASH who are willing to participate in the study

## Exclusion Criteria

- All HCWs those who will not be available during study period (annual leave, sick leave, maternity leave, week off, month off)
- All HCWs those who can't give consent to participate in the study

## Sample Size Determination

The sample was determined using the Cochran's formula for single population proportion by considering 63 percent proportion of knowledge level of hepatitis B virus among health care workers of in East Wollega zone, West Ethiopia [21].

Since the population is large, I use Cochran's formula to estimate sample size with 95% level of confidence, 5% margin of error.

$$n = (Z_{\alpha/2})^2 P(1-p)/d^2$$

Where: n = Sample size;

P = the estimated (Proportion) of population knowledge 63%;

d= margin of error;

Z ( $\alpha/2$ )= confidence interval and significance level or z-value found in a Z table=1.96

$$n = (1.96)^2 0.63(1 - 0.63) / (0.05)^2 = 358$$

## Sampling Procedures

The study participants was selected from each unit of hospital by proportion to population size allocation based on the total numbers of HCWs in each unit and by the level of education using stratified random sampling method from those who full fill eligibility criteria.

The study subjects were allocated proportionally to each unit according to the total number of the HCW in the unit.

To determine the proportional sample=>

The average HCW population of the working unit \*Total sample size (358) divided by total source population, as calculated below (Senior;Resident)

$$\text{Internal medicine: } \frac{105+358}{1968} \approx 36 \text{ HCWs (15;21)}$$

$$\text{General surgery: } \frac{127+358}{1968} \approx 23 \text{ HCWs (2;21)}$$

$$\text{Orthopaedic surgery: } \frac{88+358}{1968} \approx 15 \text{ HCWs (4;11)}$$

$$\text{Neurosurgery: } \frac{48+358}{1968} \approx 8 \text{ HCWs (2;6)}$$

$$\text{Urosurgery: } \frac{33+358}{1968} \approx 6 \text{ HCWs (1;5)}$$

$$\text{Pediatric surgery: } \frac{30+358}{1968} \approx 5 \text{ HCW (1;4)}$$

$$\text{Plastic surgery: } \frac{34+358}{1968} \approx 6 \text{ HCWs (2;4)}$$

$$\text{ENT: } \frac{23+358}{1968} \approx 4 \text{ HCWs (1;3)}$$

$$\text{GYN/OBS: } \frac{124+358}{1968} \approx 23 \text{ HCWs (5;18)}$$

$$\text{Pediatrics: } \frac{125+358}{1968} \approx 23 \text{ HCWs (6;17)}$$

$$\text{Nurses: } \frac{401+358}{1968} \approx (23 \text{ OPD;50 ward})$$

$$\text{Emergency Medicine: } \frac{43+358}{1968} \approx 8 \text{ HCWs (2;6)}$$

$$\text{Family medicine: } \frac{34+358}{1968} \approx 6 \text{ HCWs (1;5)}$$

$$\text{Neurology: } \frac{34+358}{1968} \approx 6 \text{ HCWs (3;3)}$$

$$\text{Oncology: } \frac{47+358}{1968} \approx 9 \text{ HCWs (1;8)}$$

$$\text{Anesthesiology: } \frac{63+358}{1968} \approx 12 \text{ HCWs (3;9)}$$

$$\text{Dermatology: } \frac{47+358}{1968} \approx 10 \text{ HCWs (4;6)}$$

$$\text{Radiology: } \frac{65+358}{1968} \approx 15 \text{ HCWs (4;11)}$$

$$\text{Pathology: } \frac{35+358}{1968} \approx 6 \text{ HCWs (2;4)}$$

$$\text{Laboratory: } \frac{60+358}{1968} \approx 11 \text{ HCWs}$$

$$\text{Pharmacy: } \frac{73+358}{1968} \approx 13 \text{ HCWs}$$

$$\text{Intern: } \frac{220+358}{1968} \approx 40 \text{ HCW}$$

## Data Collection and Procedures

The study project was carried out using a triangulation protocol. Data regarding knowledge on hepatitis virus infection, HBV vaccine and vaccination status on HBV was collected using structured questionnaire with an interview from HCWs who fulfill inclusion criteria from March 10 to September 10, 2020. The questionnaire was prepared in English language and it comprised a total of 51 questions. The first part is regarding socio-demographic characteristics of the participants which have 8 questions, the second part is about knowledge of Hepatitis B infection which contains two sub-categories: each sub-category has 11 questions and the third part is about knowledge of HBV vaccine and about vaccination status, which has two sub-categories each of them has 10 and 11 questions respectively.

## Data Quality Control Data

Data quality was assured by designing data collection instrument and training of data collectors and supervisors was done. The data collector was selected in each level of education and trained. The collected data was reviewed and checked for completeness by principal investigator each day.

## Data Processing and Analysis

All the data was checked for completeness and internal consistency by cross checking and then was coded and double entered into Epi Data version 4.2 computer software packages and cleaned for inconsistency. For further analysis the data was exported to Statistical Package for Social Science (SPSS) version 26 software. The descriptive analysis of data indicates using numerical summary measures and the data was presented using frequency tables, figures and graphs. Binary and multiple logistic regressions were used to show association between dependent and independent variables.

## Operational Definitions

### Health Care Workers (HCWs)

individuals who are directly involved in patient care including doctors, midwives, nurses, pharmacist, anesthetists and laboratory technicians (technologists).

### Vaccination Status

Depending on the number of doses they received it is categorized into fully vaccinated, partially vaccinated and unvaccinated

- **Fully Vaccinated:** -Those health care workers who received a full course (3 doses) or more of hepatitis B vaccine
- **Partially Vaccinated:** -Those health care workers who received only 1 or 2 doses of hepatitis B vaccine.
- **Unvaccinated:** -Those health care workers who didn't received any doses of hepatitis B vaccine.
- **Knowledge-** Awareness about the HBV, ways of transmission, prevention and about HBV vaccine.
- **Good Knowledge:** refers for those study participants who answer more than the mean knowledge questions correctly.
- **Poor Knowledge:** refers for those study participants who answer less than or equal to mean of knowledge questions correctly.

### Ethical Consideration

The study protocol was submitted for approval to both ethical review committees of Department of Internal medicine and to Addis Ababa University, college of medicine and health sciences. Verbal Informed consent was reviewed from all the participants. It was made sure that adequate explanations are given to participants about the study project and their right not to be involved in the study if they don't wish and their ability to withdraw from the study.

## Result

### Background Characteristics of Study Participants

The questionnaire was distributed to a total 358 HCWs, and all of them completed the questionnaire, making the response rate of 100%. From these participants, 208 (58.1%) were males and 150(41.9%) were females (see Figure 1). The participants' age ranged from 23 to 62yrs (see Figure 2)

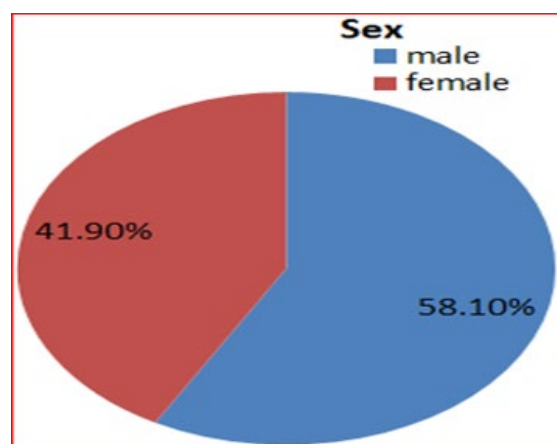


Figure 1

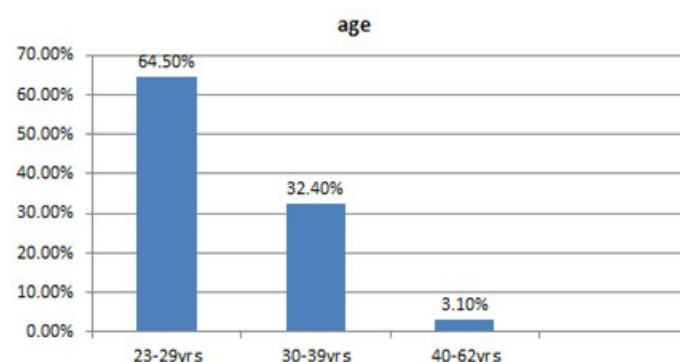


figure 2: Distribution of age

years with an average age of 29.13±4.3 years, the majority 231 (64.5%) of whom were in the age group of 23-29 years & the remaining one-third were 30 years or older, as shown in Table 1. A little more than two-third 244 (68.2%) of the health care professionals were Orthodox religion followers while the remaining responded to have other religious affiliations. And about two-third (139;66.8%) of the health care professionals reported to be single by the time of data collection as shown in Table 1.

**Table 1: Background characteristics of HCW working at TASH, AA, Ethiopia, March 10 to September 10, 2020**

Variable		Frequency (n=358)	Percent (%)
Sex	Male	208	58.1
	Female	150	41.9
Age category	23-29	231	64.5
	30-39	116	32.4
	40-62	11	3.1
Religion	Orthodox	244	68.2
	Muslim	36	10.1
	Protestant	69	19.3
	Catholic	4	1.1
	Other	5	1.4
Marital status	Married	119	33.2
	Single	139	66.8

Educational level	Diploma	6	1.7
	Degree	236	65.9
	Master	36	10
	Specialist	70	19.6
	Subspecialist	10	2.8
Profession	Nurse	75	20.9
	Lab technician	11	3.1
	Pharmacist	14	3.9
	Intern	41	11.5
	Resident	166	46.4
	Consultant	46	12.6
	Mid wife	5	1.4
Current working unit	Outpatient	56	15.6
	Inpatient	210	58.7
	Emergency & critical care	51	14.2
	Radiology unit	14	3.9
	Surgical theatre	17	4.8
	Others	10	2.8
Work experience	<1 year	52	14.6
	1-3 years	85	23.7
	>3 years	221	61.7

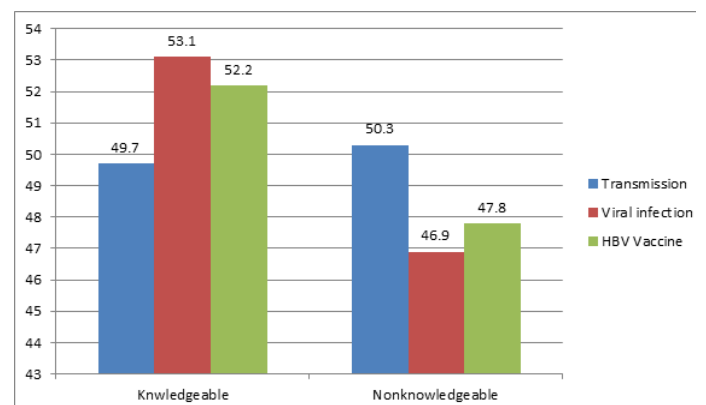
With respect to educational background, nearly two-third (236; 65.9%) of the participants was degree holders and majorities (166; 46.4%) of the studied participants were resident physicians. And regarding the current working unit, more than half (210; 58.7%) of the respondents were working in one of the inpatient units including medical ward (18.4%), surgical ward (15.6%), pediatric ward (9.2%), gyn/labour ward 8.1%, oncology ward 3.9% and other in pt wards is 3.5% Followed by out pt clinic 56(15.6%), ER and ICU 51(14.2%) each of them 9.2% and 5% respectively. The remaining are in surgical theatre (4%), radiology unit (3.9%), pathology unit (1.4%), dermatology (1.4%) and neurology unit (0.8%). And most of the respondents (221; 61.7%) had more than three years of experience as health care providers (Table 1).

### Knowledge of Health Care Workers About Hepatitis B Infection

In this study, HBV-related knowledge was assessed with 32 items concerning knowledge of hepatitis B virus infection, its transmission and its prevention. The correct answer to each item was scored as 1 and the incorrect answer was scored as 0. The respondents' score ranged from 11 to 31, and the mean was 22.2(71.6%) with a standard deviation of 3.98. The health care workers who scored above the mean (above 71.6% of the knowledge questions) were considered as knowledgeable and those scored the mean and below were considered as not knowledgeable. Accordingly, a little more than half (184; 51.4%) of all the respondents were knowledgeable while the remaining (174; 48.6%) were not knowledgeable, as detailed in Fig. 3.

Furthermore, regarding the transmission route of the virus, half of the respondents (180; 50.3%) scored less than the mean as

they responded either mistakenly or declared as 'they don't know' to the transmission-related knowledge question items. With respect to the natural history of the disease, a little more than half (190;53.1%)of the participants scored above the mean while near to a similar size (187;52.2%) of the participants scored above the mean of the prevention-related knowledge questions, as shown in Fig.3.



**Figure 3:** HBV-related knowledge level of HCW working at TASH, AA, Ethiopia, July 1 to August 31, 2020

Moreover, among the entire 32-knowledge question items responded by the participants, the most correctly answered ones were the possibility of vertical transmission (mother to child transmission during birth) (98.6%), the possibility of transmission via injecting needles (98.6%) and unprotected sex (97.8%).

In contrast, the most of the participants failed to recognize that HBV can't be transmitted through breast feeding (77.4%) &



kissing (71.6%) and 72% of the respondents didn't know the exact incubation period of the virus. In other words, more than two-third (68.7%) of the participants answered incorrectly to the question 'HBV can be transmitted through breast feeding' & 31 (8.7%) of all the participants declared as they don't know the answer whereas 249 (69.6) erroneously believed that HBV can be transmitted via kissing and 7 (2%) of all the participants confused as they don't know whether the virus can transmit via kissing a person or not.

#### Vaccination Status of Health Care Workers Against HBV

Out of 358 respondents, a little more three-fourth (280; 78.2%) were vaccinated while the remaining 78 (21.8%) claimed to be unvaccinated by the time of data collection. Among the vaccinated ones, majority (215; 76.8%) reported to take three doses of the vaccine whereas 65 (23.2%) of them were partially vac-

inated by the time of data collection (taking only one or two of the vaccine). However, only 23 (10.7%) of the fully vaccinated HCWs reported to have their post-vaccination hep B titers checked after successfully completed taking the series of vaccines while most (192; 89.3%) of the fully vaccinated ones failed to have any serologic testing once they were fully vaccinated for reasons detailed in Table 2, the most common being lack of knowledge as 94(43.7%) followed by lack of access 72(37.5%).

On the other hand, among the 78 non-vaccinated respondents, two-third (52; 66.6%) claim not to be immunized because lack of access while 7 (9%) of the non-vaccinated HCWs didn't think it was important. The other reason mentioned was hepatitis B virus infectivity, as 4 (5.1%) reported to be tested positive (see Table 2).

**Table 2: Vaccination status & related factors of HCW working at TASH, AA, Ethiopia, July 1 to August 31, 2020**

Variable		Frequency (n=358)	Percent (%)
Vaccination status	Yes	280	78.2
	No	78	21.8
Number of doses taken	1	20	7.2%
	2	45	16.7%
	3	212	76%
	>3	3	0.1%
Reason for non-immunization	No need	7	9%
	Lack of access	52	67%
	HBV-infected	4	5%
	Other	15	19%
Anti-HBs level	Checked	23	10.7%
	Not checked	192	89.3%
Reason for not checking antibody level	No need	12	6.2%
	Cost issue	14	7.3%
	Lack of access	72	37.5%
	Lack of knowledge	94	49%

**Factors Associated With Knowledge of Health Care Workers**  
Among the nine potential factors considered in this study (those listed in Table 1 & history of training), only four factors, namely sex, type of profession, history of being trained on infection prevention, & duration of work experience of the health care workers were observed in binary analysis to be associated with general knowledge of HCWs regarding Hepatitis B infection. To control for possible confounders, further multiple logistic analysis was done, the only factor that showed statistically significant association was the type of profession of health care workers.

The finding of this study shows that when compared to nurses, intern physicians are 11 folds more likely to be knowledgeable about hepatitis B infection[AOR=11.3(95% CI=4.5,28.6)] with

p value of <0.001. Likewise, consultant physicians were shown to be 7 times more knowledgeable about hepatitis B infection than nurses [AOR=7(95% CI=3.1,15.9)] with <0.001. Moreover, compared to their nurse counterparts, resident physician showed more 3 odds of having knowledge regarding hepatitis B infection [AOR=3.5(95% CI=1.9,6.9)] with strong p value (<0.001). On the other hand, laboratory technicians & technologists, in reference to nurses, had far lower knowledge level about HBV infection according to the scores observed in the study [AOR=0.27(95% CI=0.03,2.3)], but this was not statistically significant as p value was 0.23 (Table 3)

**Table 3: Binary and multiple logistic regression model showing predictors of general knowledge about HBV among HCW working at TASH, AA, Ethiopia, march 10 to September 10, 2020**

Variable		COR at 95% CI	P value	AOR at 95% CI	P value
Sex	Male	1.75(1.1,2.7)	0.01	-	-
	Female	1 (Reference)	-	-	-
Profession	Nurse	1 (Reference)	-	1 (Reference)	-
	Lab technician	0.27(0.03,2.3)	0.23	0.27(0.03,2.3)	0.23
	Pharmacist	1.1(0.3,3.9)	0.88	1.1(0.3,3.9)	0.88
	Intern	11.3(4.5,28.6)	<0.001	11.3(4.5,28.6)	<0.001
	Resident	3.5(1.9,6.4)	<0.001	3.5(1.9,6.3)	<0.001
	Consultant	7(3.1,15.9)	<0.001	7(3.1,15.9)	<0.001
	Others	-	-	-	-
	Other	15	19%		
Training taken	Yes	1.4(0.86,2.4)	0.17	-	-
	No	1 (Reference)		-	-
Work experience	<1 year	3.6(1.8,7.1)	<0.001	-	-
	1-3 years	1.3(0.78,2.1)	0.32	-	-
	>3 years	1 (Reference)	-	-	-

N.B: These variables are from the total variables statistically significant while cross tabulation done (p<0.25)

**Factors Associated With Vaccination Status of Health Care Workers**

In order to identify factors associated with vaccination status of HCWs, a total of thirteen potential factors (that included history of occupational exposure & infection prevention training) in addition to those listed in Table 1 were considered. Among these, only four factors, such as sex, type of profession, current working unit, & work experience of the health care workers were observed in binary logistic analysis to be associated with vaccination status of HCWs regarding Hepatitis B infection. To control for possible confounders, further multiple logistic analysis was done, the only factor that showed statistically significant

association was the work experience of the health professionals, as depicted in Table 4.

As a result, this study revealed that HCWs who had less than a year experience had almost five folds likelihood of being vaccinated [AOR=4.7(95%=1.4,15.8)] with a p value of 0.012, when compared to their counterparts who had work experience of more than three years. On the other hand, there was no any statistically significant difference in odds of being vaccinated between those HCWs whose experience ranged from 1 to 3 years and those who had more than 3 years of work experience, as shown in Table 4.

**Table 4: Binary and multiple logistic regression model showing predictors of HBV vaccination of HCW working at TASH, AA, Ethiopia, March 10 to September 10, 2020**

Variable		COR at 95% CI	P value	AOR at 95% CI	P value
Sex	Male	1 (Reference)	-	-	-
	Female	1.4(0.82,2.3)	0.23	-	-
Profession	Nurse	1 (Reference)	-	-	-
	Lab technician	2.5(0.3,21)	0.4	-	-
	Pharmacist	0.3(0.1,1.1)	0.07	-	-
	Intern	3.2(0.86,11.7)	0.08	-	-
	Resident	0.7(0.4,1.4)	0.37	-	-
	Consultant	0.9(0.36,2.2)	0.82	-	-
	Others	-	-	-	-
	Other				
Training taken Work experience	Outpatient	2.2(0.9,5.3)	0.08	-	-
	Inpatient	2.8(1.3,5.9)	0.006	-	-
	Emergency & critical care	4.2(1.5,11.6)	0.006	-	-
	Maternity unit	3.3(0.6,17.3)	0.15	-	-
	Surgical theatre	2.1(0.7,6.4)	0.19	-	-
	Others	1 (Reference)	-	-	-

Work experience	<1 year	3.5(1.2,10.3)	0.02	4.7(1.4,15.8)	0.012
	1-3 years	0.75(0.4,1.3)	0.32	0.75(0.43,1.3)	0.32
	>3 years	1 (Reference)	-	1 (Reference)	-
N.B: These variables are from the total variables statistically significant while cross tabulation done (p<0.25)					

## Discussion

As HCWs are at the primary providers of healthcare, it is expected that they have adequate knowledge about natural history, transmission routes, and infectivity and prevention mechanisms of infectious agents such as HBV to protect their patients and themselves from nosocomial infections. The result of this study showed that about half (51.4%) of health care workers had relatively adequate knowledge while a significant proportion lacks adequate knowledge. This finding is in line with the study conducted in Brazil that aimed to assess the hepatitis B knowledge of health care workers & revealed about half (51.4%) of HCWs had adequate knowledge level of Hepatitis B virus infection [23]. More interestingly, the current knowledge level recorded is in concordance with the finding of the study done in Bahir Dar city administration, Ethiopia, which observed 52% and 62% of the respondents were knowledgeable about hepatitis B infection & vaccine [25].

On the other hand, the knowledge level of the respondents' of this study were a little higher than the 47.0% obtained in Yaoundé among HCWs, but it was lower than that of the study done by Akazong and Colleagues which documented that 67.6% in their study that aimed to evaluate the knowledge and attitude of HCWs towards HBV in Cameroon. It was also very low compared to study conducted in Nigerian tertiary hospitals among HCWs that revealed only about 23% of the respondents had poor knowledge about the virus [24].

The possible reason discrepancies in the level of knowledge of health care workers might be due to the difference in the provision of infection prevention among these settings. For example, a majority (279; 77.9%) of the participants of this study reported not to be trained on hepatitis B virus.

In the current study, the only factor that was noted to predict reasonably good knowledge of HBV among HCWs was type of profession. In particular, medical doctors showed excellent level of knowledge when compared to nurses, with interns, consultants & resident physicians having 11, 7, & 3.5 odds of having better scores, respectively. Intern's higher knowledge level can be justified by the fact that internship is a period of active learning when final year students solidify their fresh clinical memories and also influenced by seniors on their infection prevention on their day to day activity. But it is difficult to make conclusions due to the possibility of information bias since questionnaire was done online.

With regard to vaccination coverage of health care workers, this study revealed that 78.2% of HCWs were vaccinated with at least one dose of HBV vaccine although only 60% of all HCWs were fully vaccinated. This coverage was better than the one reported in Health institutions of East Wollega Zone where the percentage of vaccination was 59.8% and that of fully vaccinated HCWs was 34.2%, it is also much better than fully vacci-

nated HCWs of University Gondar hospital, Shashemene Zonal Town, Bahir Dar City which was 28.7%, 12.9% and 5.4% respectively [21, 25, 26]. In addition, this is better than 2017 WHO prediction on developing country which was 18 to 39% [16], the vaccination coverage in this study was relatively poorer when compared to the study done in a tertiary care hospital in Pakistan which showed a fully vaccinated rate among HCWs of 73.42%. Hence, the vaccination coverage among HCWs working in TASH, Ethiopia is suboptimal as WHO recommends every HCW should be fully immunized against the virus. In addition to that this is 2020 study on largest specialized hospital of the country which should be role model of the other hospital in the country by fulfill WHO recommendation.

Furthermore, among the reasons for not being vaccinated, the poverty-related factors such as lack of access to the vaccine were the primarily reported ones in this study. The reasons were similar to the study conducted in HCWs of Shashemene Zonal town in which 75.6% of the HCWs were reported not to be vaccinated. Moreover, lack of diagnostic availability to the serologic testing in addition to the lack of knowledge regarding the serologic testing were reported to play a role in this study for not checking their hepatitis B titers after vaccination.

Although it can be anticipated that HCWs are likely to be vaccinated as their duration work increases, HCWs who had work experience of less than a year, according to this study, had higher odds of being vaccinated when compared to those who had more than three years of experience. This was in contrast with the study done in Shashemene which showed those with at least ten years of work experience had greater odds of being vaccinated than those who had less than four years' experience. This discrepancy might be in part explained by fact interns, who were dwellers of the hospital for more than 5 years by the time of data collection, considered themselves as having less than a year experience.

## Strength & Limitations of The Study

### Strength

- In this study, a stratified sampling technique was used & this was believed to make the studied population more or less representative of the diverse health care workers working in the town.
- The response rate in the present study was high, which may imply the high level of motivation or curiosity of HCW towards the disease.

### Limitations

- This study design was a cross-sectional, and hence it is challenging to conclude regarding causality and alternative explanations of the findings.
- Because vaccination status was self-reported, recall bias could occur and this may led to over- or underestimation of vaccination coverage.
- The data collection method of this study was an online-administered questionnaire that is prone to information bias.



Lack of a standard tool (with a standard cutoff point) for measuring HBV-related knowledge was a challenge in this study.

### Conclusion & Recommendation

In the current study, a significant proportion (48.6%) of health care workers had relatively inadequate HBV-related knowledge. And one-fifth of HCWs also reported that they didn't receive any dose of hepatitis B vaccine, and also another one fifth are only partially vaccinated despite it is the only potentially cure health care associated infection and all HCWs expected to be vaccinated and know their immunity status.

Considering the inadequate knowledge level of the HCWs, concerned bodies should give training on hepatitis B infection, transmission routes, prevention and control.

Despite the vaccination status is better than majority of developing country data and significantly higher than similar study conducted in the county it is still need great attention to make avail vaccine to achieve 2030 WHO goal that HBV infection should be eradicate.

In this study the needle stick injury prevalence is 58.1% which shows HCWs should know their immune status in addition to vaccination, but the immune status in this study shows very low (6.4%).so the concerned stakeholders should devote more efforts to improve awareness of HBV infection, HBV vaccine and availing the vaccine as well as machine which measures immune status of fully vaccinated HCWs which is standard of care for HCWs.

### Authors' Contributions

AG: was the primary researcher, conceived the study, data collection, analysis, interpretation of the findings, drafting the manuscript, and write-up. SW participated in data collection, drafting the manuscript, and write-up. YB: Substantially participated in the study's design, analysis, and interpretations of the findings. All authors read and approved the final manuscript. AA: drafting the manuscript and write up.

### Acknowledgments

We are grateful to Tikur Anbessa who provided financial support for the research project. We are grateful to the study participants.

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